Chapter 2

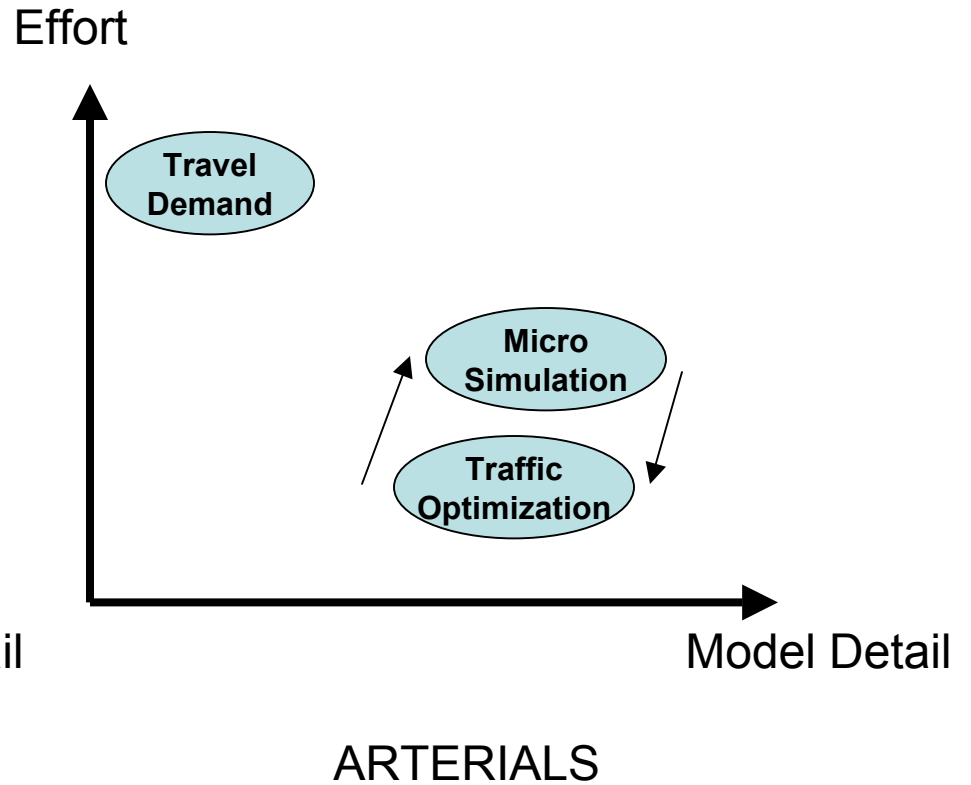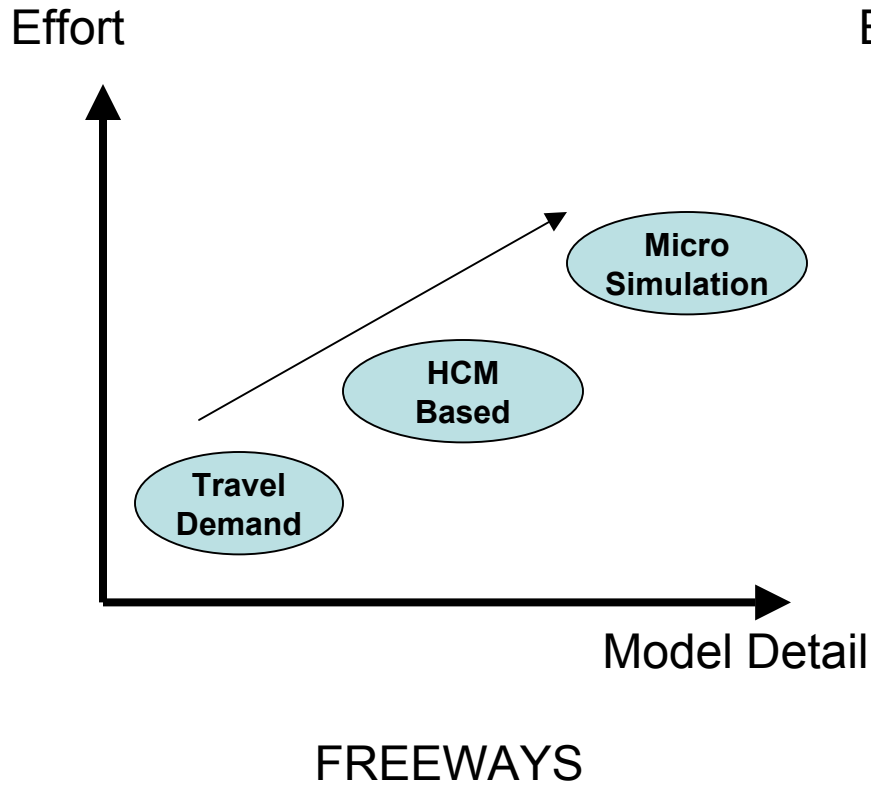# HCM vs Microsimulation

John Hourdakis
Center for Transportation Studies, U of Mn
Hourd001@tc.umn.edu

Choices

Effort

Micro Simulation

HCM Based

Travel Demand

Model Detail

FREEWAYS

Effort

Travel Demand

Micro Simulation

Traffic Optimization

Model Detail

ARTERIALS

Travel Demand Tools

- Purpose is to Provide Forecasted Volumes For Modeling
- Assign Trips Based on Number of Lanes and Relative Capacity
- TDM Tools Do Not Explicitly Model Geometric Features or Traffic Controls
- Twin Cities Regional Model
  - EMME2
  - TP+ (TRANPLAN)

Traffic Optimization Tools

- Purpose is to Optimize Traffic Control and Determine Lane Assignments For Arterials

- Do Not Model Freeway, No Consideration of:
  - Geometric Features
  - Driving Behaviors
  - Interactions Between Intersection

- Examples:
  - SYNCHRO
  - TRANSYT

Highway Capacity Manual Methodologies

- Based on Empirical Models
  - Well Tested With Field Validation Experience
  - Good For Analysis of Isolated Segments
  - Good For Moderate Congestion Levels

- Pre-study Tool
  - Project Scoping
  - Sizing the Improvements

HCM (Continued)

- HCM Does Not Directly Address Cases Where:
  - Queues Spill Back From One Freeway Segment to Another
  - Queues That Overflow or Block Turn Pockets
  - Queues From Arterials That Backup Into the Freeway
  - Queues From Freeway That Backup Into the Arterial
  - Two-way Left Turn Lanes
  - Roundabouts of More Than One Lane

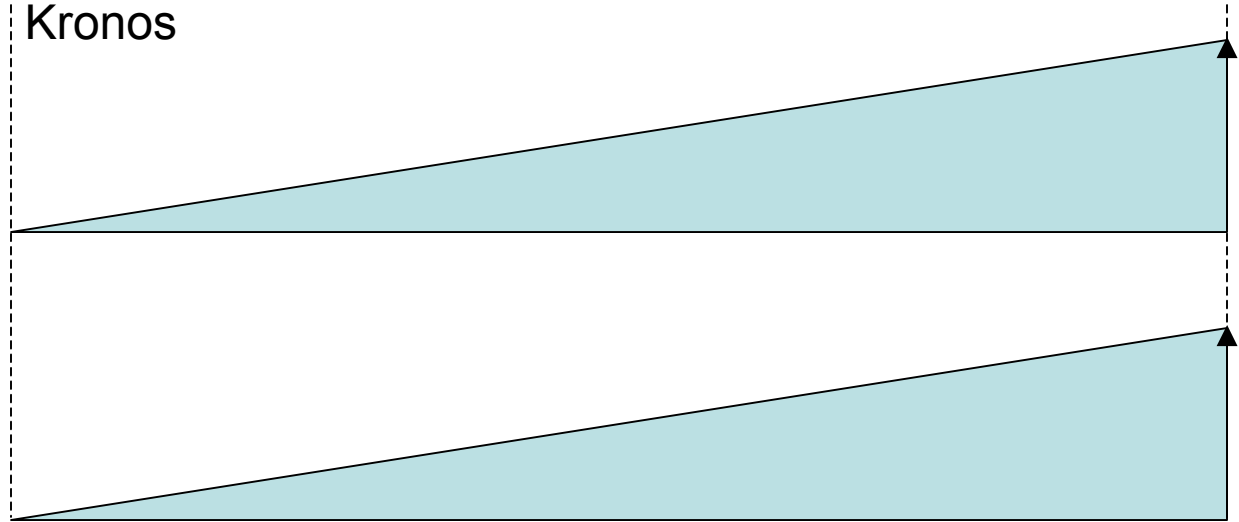# Traffic Simulation

Macroscopic: FreeFlow
Kronos

Microscopic: CORSIM
AIMSUN
VISSIM

Data Requirements

Output Detail

All Can Handle Interaction Between Road Segments!
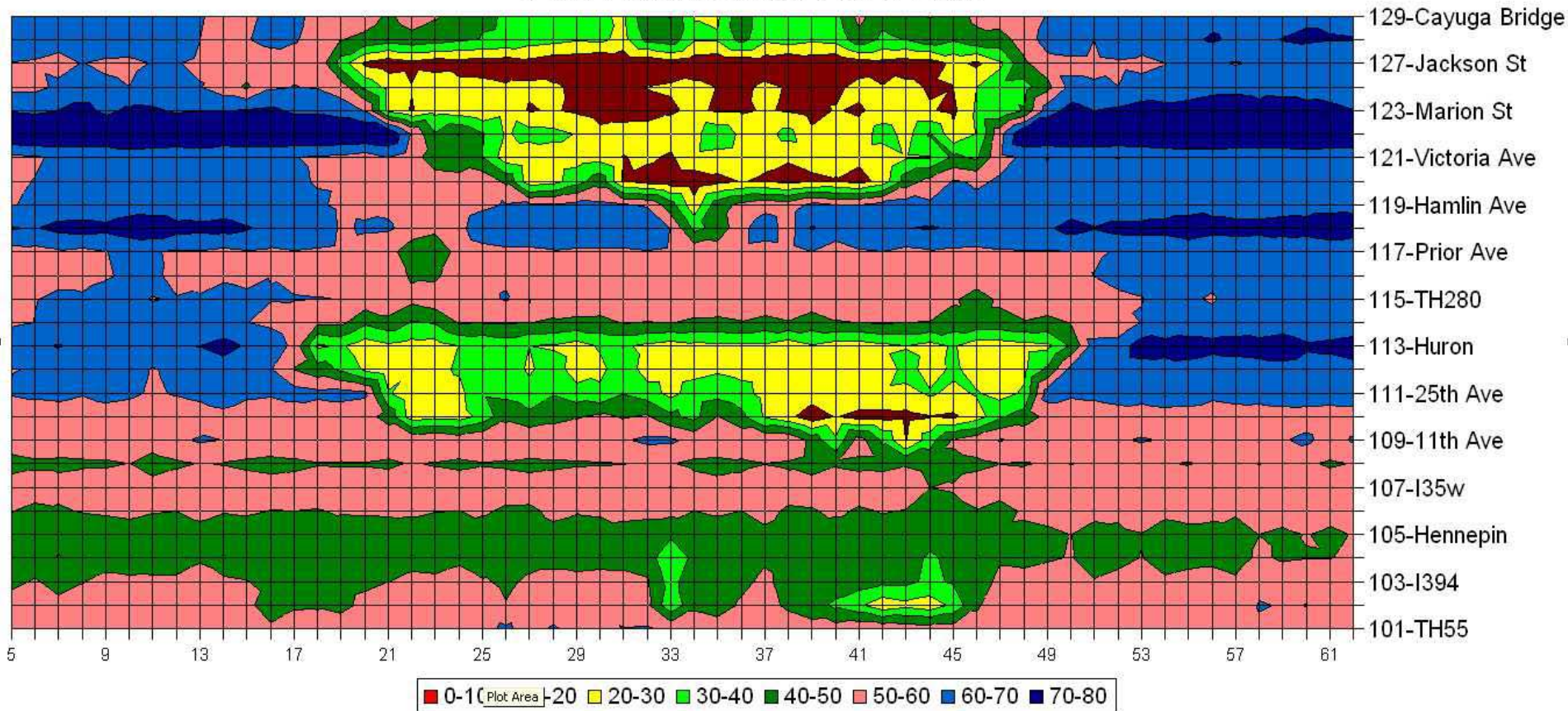
Dynamic Traffic Assignment Microsimulation?
Coming Soon.
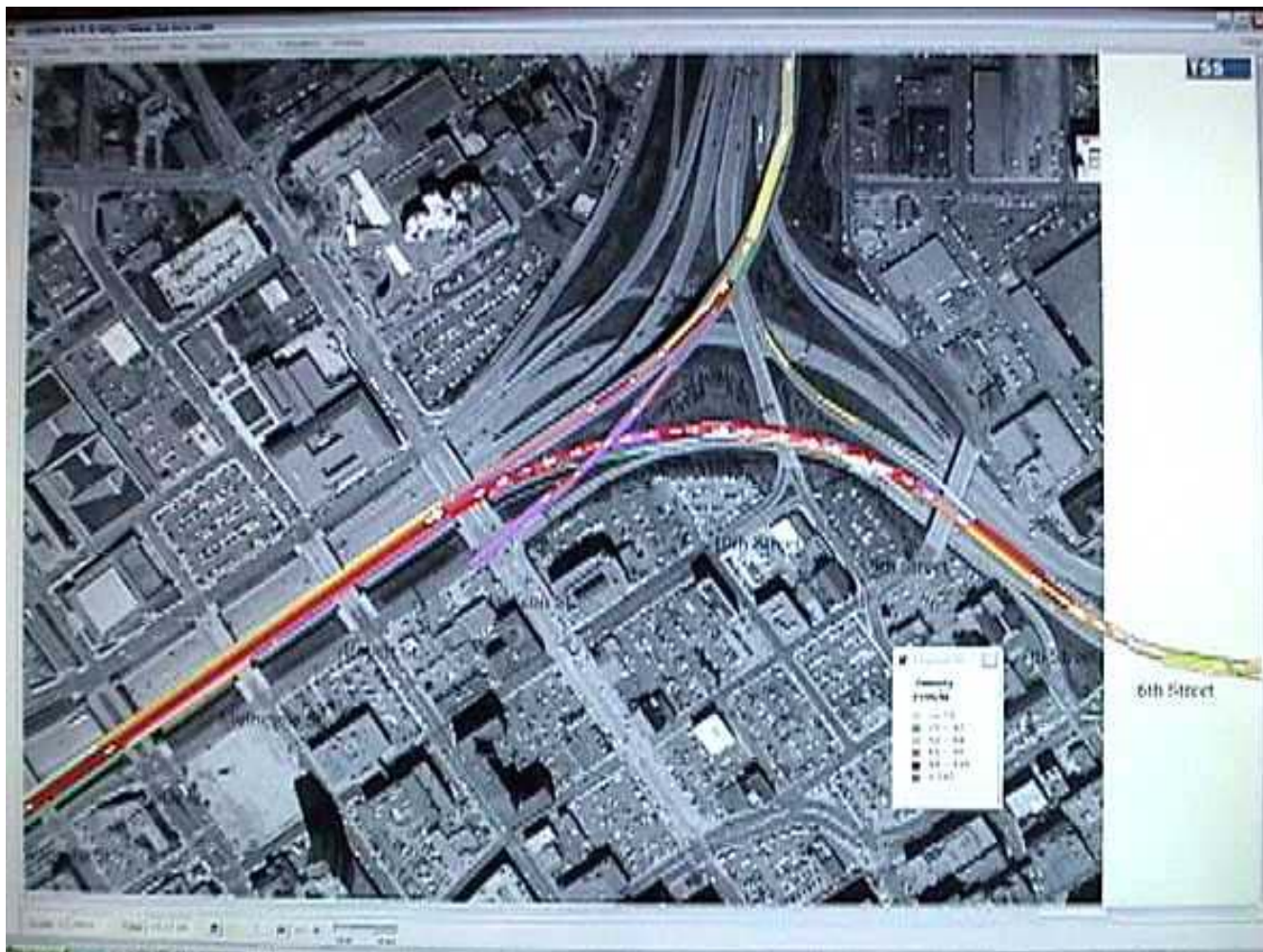
Examples Where Simulation is Required

- I-94 Eastbound
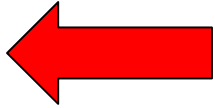- The Big Mess of I-94/35W Commons

Speed on I-94
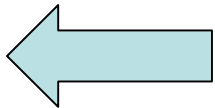

I-94 Eastbound PM Peak
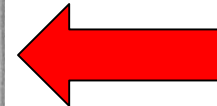
Simulation of I-94

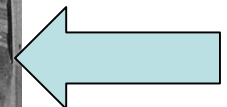# I-94/35W Commons Mess

Section A
Cedar Ave to 11th

Section B
11th to 35W

Section C
35W to Tunnel

General Simulation Issues

- Simplifies the Real World
- Requires Time to Learn
- Requires Current Data
- Calibration Can be Time Consuming
- Cannot Handle Every Situation
- Manage Large Amounts of Data
- Acceptance and Credibility

Simulation Shortcomings

- Shortcomings Include
  - Two-Way Left Turn Lanes
  - The Impacts of Raised Medians
  - The Impacts of On-Street Parking, Commercial Vehicle Loading and Double Parking
  - The Interference From Bicycles and Pedestrians

- Simulation Assumes 100% Safe Drivers
  - Nobody Violates the Safe Headway
  - Everyone Pays Attention
  - There Are No Collisions

Simulation Pitfalls

- Data Availability
  - Variability in Space and Time
  - Simultaneous Counts on All Boundaries
- Inaccurate Input Data
- Knowledge of How Model Parameters Work
- Understanding of MOE Definitions and Calculations
- Misunderstanding of Local Traffic Operations

Criteria for Selecting a Traffic Tool Category

Analysis Context:
Planning, Design, or Operations/Construction

1 Geographic Scope	**2** Facility Type	**3** Travel Mode	**4** Management Strategy	**5** Traveler Response	**6** Performance Measures	**7** Tool/Cost-Effectiveness
What is your study area?	Which facility types do you want to include?	Which travel modes do you want to include?	Which management strategies should be analyzed?	Which traveler responses should be analyzed?	What performance measures are needed?	What operational characteristics are necessary?
• Isolated Location • Segment • Corridor/ Small Network • Region	• Isolated Intersection • Roundabout • Arterial • Highway • Freeway • HOV Lane • HOV Bypass Lane • Ramp • Auxiliary Lane • Reversible Lane • Truck Lane • Bus Lane • Toll Plaza • Light Rail Line	• SOV • HOV (2, 3, 3+) • Bus • Rail • Truck • Motorcycle • Bicycle • Pedestrian	• Freeway Mgmt • Arterial Intersections • Arterial Mgmt • Incident Mgmt • Emergency Mgmt • Work Zone • Spec Event • APTS • ATIS • Electronic Payment • RRX • CVO • AVCSS • Weather Mgmt • TDM	• Route Diversion – Pre-Trip – En-Route • Mode Shift • Departure Time Choice • Destination Change • Induced/ Foregone Demand	• LOS • Speed • Travel Time • Volume • Travel Distance • Ridership • AVO • v/c Ratio • Density • VMT/PMT • VHT/PHT • Delay • Queue Length • # Stops • Crashes/ Duration • TT Reliability • Emissions/ Fuel Consump • Noise • Mode Split • Benefit/Cost	• Tool Capital Cost • Effort (Cost/ Training) • Ease of Use • Popular/Well-Trusted • Hardware Requirements • Data Requirements • Computer Run Time • Post-Processing • Documentation • User Support • Key Parameters User Definable • Default Values • Integration • Animation/ Presentation

Source: FHWA Traffic Analysis Tools Primer

Conclusions
Choosing the Right Tool

- Have All Needed Features
- Requires Data You Have or Can Get
- Is an Established Model
- Has Good Documentation and Support
- Has Clear and Correct Definitions of Output
- Has Wide User Base Where You Can Draw Experience From